

Updates to NWRFC 1991-2020 Normals

October 24, 2021

The Northwest River Forecast Center provides 'normals' for many of the data types used on our webpage and internal forecast processes. As used here, the term normals generally refers to the mean (average) or median of the data across a 30 year period. Updated once a decade, the current 30 year period consists of water years 1991-2020.

Runoff

Runoff estimates underpin monthly, seasonal, and annual forecasts issued by the NWRFC. Runoff is the volume of streamflow that passes a given point over a period of time and is commonly expressed in units of thousands of acre-feet (KAF). Forecast are commonly represented as a percent of normal in order to provide historical perspective.

Runoff comes in several flavors:

- Unadjusted runoff represents the conditions at a gage and is not adjusted for upstream man-made impediments or activity. Unadjusted runoff below a dam reflects water released from the dam and unadjusted runoff in an unimpeded headwater represents the natural condition at that location.
- Adjusted runoff includes adjustments to the raw (unadjusted) data, often for the purpose of estimating the natural flow state. This may include accounting for upstream storage, irrigation, or consumptive use.

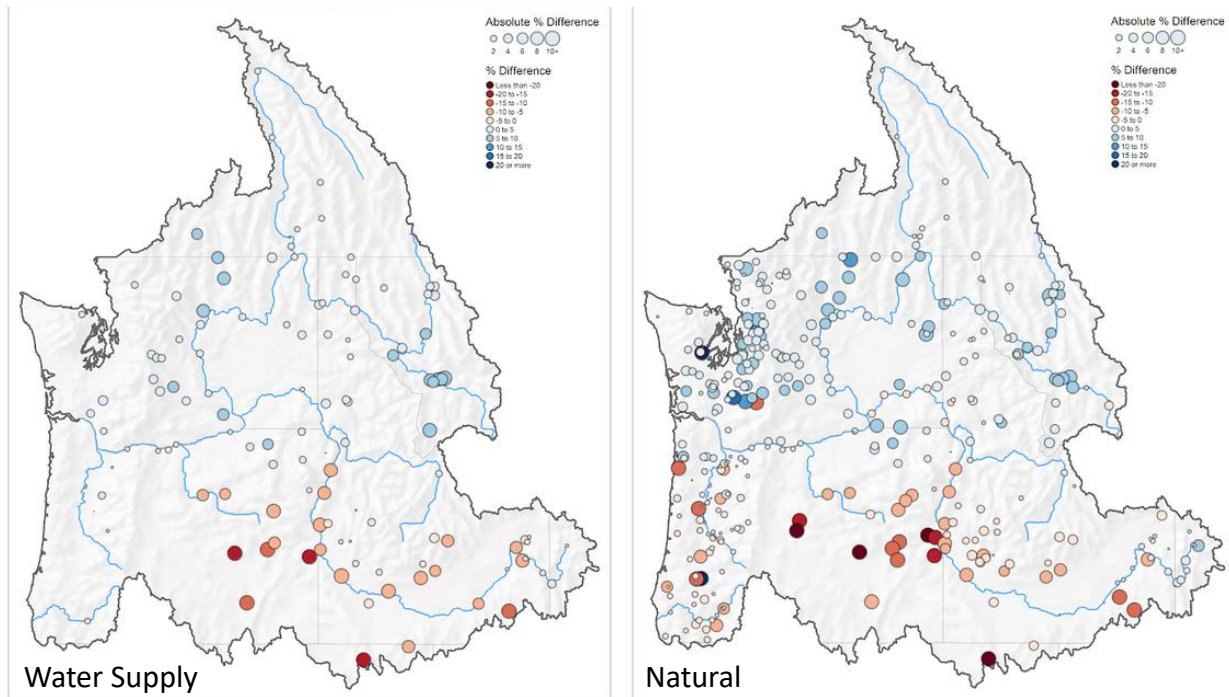
Two types of adjusted runoff are estimated (and forecasted) at the NWRFC

- Water supply runoff and forecasts have a long history of operational used by water managers throughout the Columbia Basin. Over the years, adjustments have been agreed upon by partner agencies and generally (but not always) include adjustment for major upstream storage.
- Natural runoff estimates (and forecasts) were introduced by the NWRFC in 2015. These locations take full advantage of our hydrologic modelling system and provide a more comprehensive estimate of natural flow. This includes all upstream storage, consumptive use, and other depletions. In addition, natural runoff estimates are routed downstream from one segment to the next (unlike water supply adjustments that are simply additive).

For the 1991-2020 normals update, raw data was gathered from many partner agencies. From the raw data, monthly runoff estimates for the natural and water supply runoff cases were created for the period of October 1948 through October 2020. Monthly and seasonal 30 years normals were calculated based on the WY1991-2020 period.

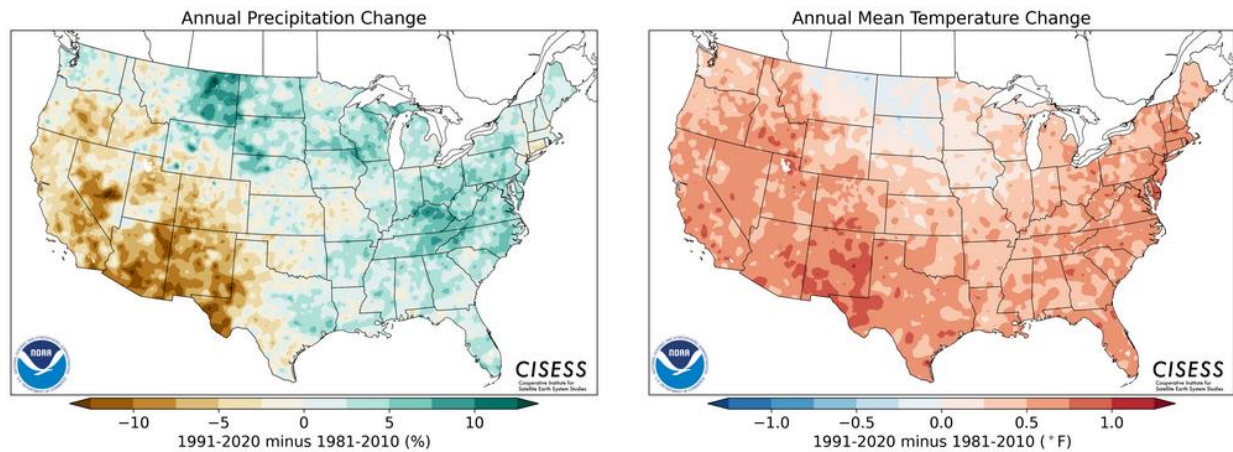
An annual comparison of the difference between the current (1991-2020) and previous (1981-2010) normals shows a general trend with increased volumes in the northern part of Columbia River Basin and decreased volumes across southern basins. The difference is starkest for smaller arid basins where the annual volumes show a high degree of natural variability and can be challenging to describe with a simple 30 average.

Percent Difference Between WY 91-20 and WY 81-20 Water Supply and Natural Normals for Annual Period



Source: NWRFC

This pattern is consistent with the changes in precipitation and temperature normal for the Pacific Northwest:



Source: <https://www.ncei.noaa.gov/products/land-based-station/us-climate-normals>

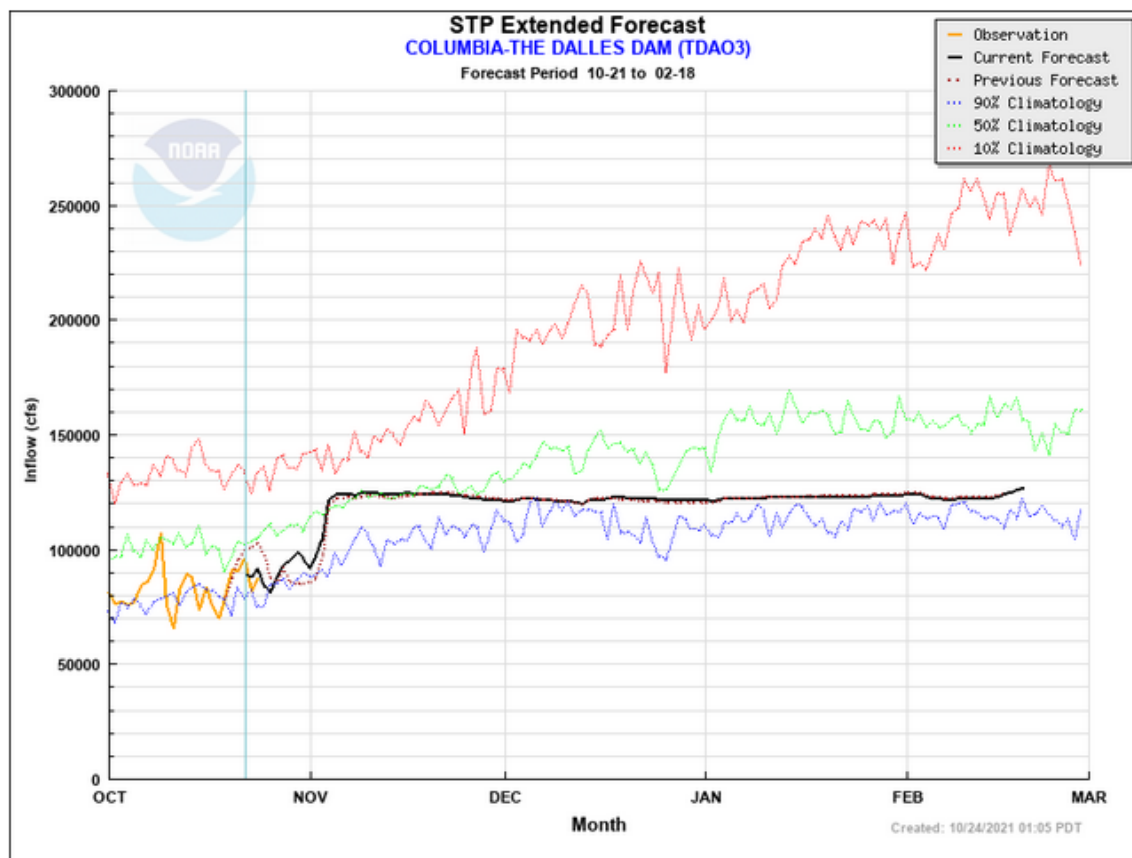
For the Columbia River at the Dalles the new natural and water supply runoff normals show a very slight (< 2%) increase from previous.

Updated runoff data and normals were published to the NWRFC web page on October 13, 2021.

Single Trace Procedure (STP)

The NWRFC STP product is three to four month deterministic streamflow forecast produced in partnership with the NW Division office of the US Army Corps of Engineers (USACE). The model is forced with a weather input (precipitation and temperature on a 6hr time step) and combines NWS weather forecasts for the first 10 days and a mean historical weather starting day 11. The product's purpose is to provide USACE with a reasonable streamflow volume forecast that can be used as a starting point for water management decisions. STP forecasts shared on the NWRFC website are typically for inflow at reservoirs and discharge at downstream locations. STP normals are expressed as the 10, 50, and 90% exceedance probabilities based on the 1991-2020 record.

As an example, the graphic below shows the Oct 21st STP inflow forecast for the Columbia at The Dalles Dam. The included climatology traces show that the forecasted inflows at the project will be on the drier side of what has been experienced during the 1991-2020 period (the green 50% trace represents daily median conditions for the period). Forecast and historical inflow at this site will reflect the amount of water naturally available in combination with management practices upstream or at the dam itself.

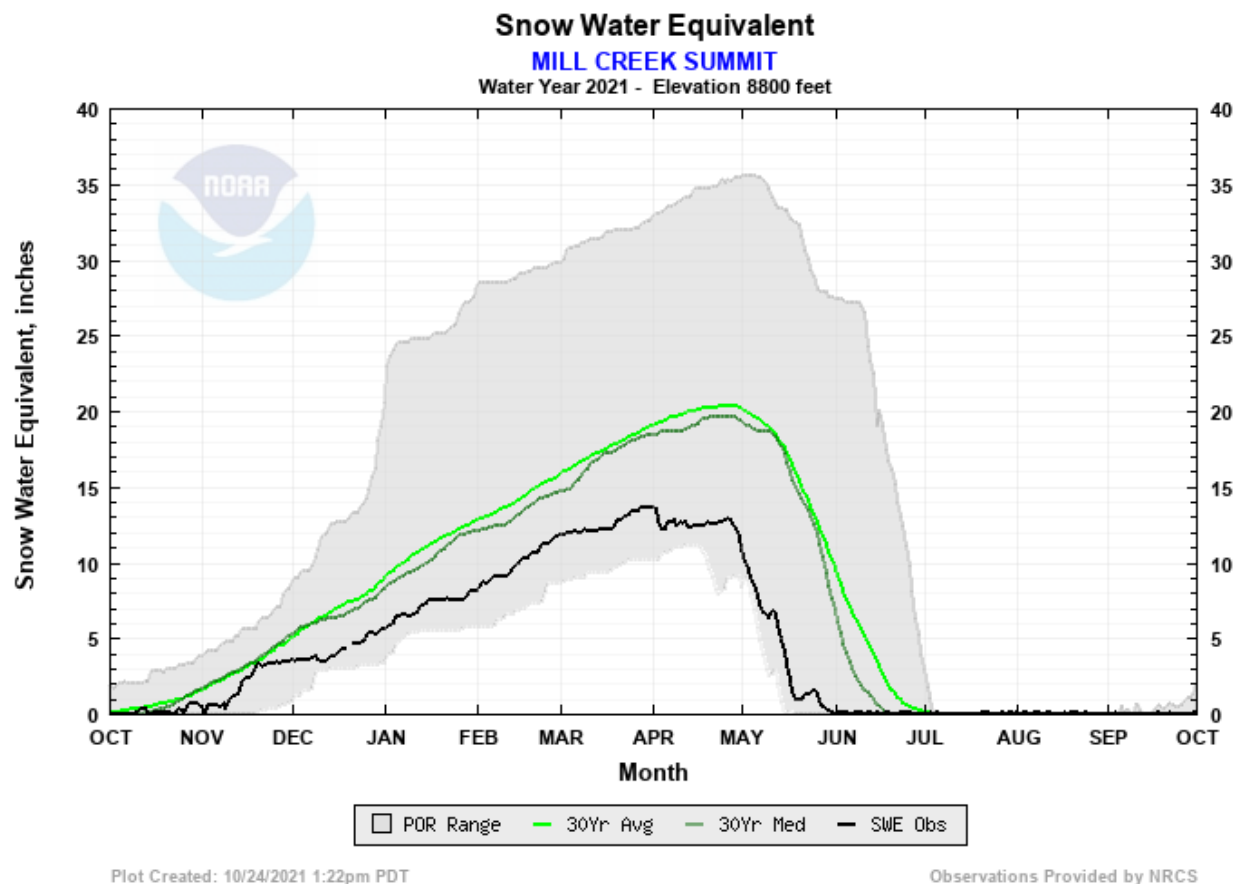


Source: <https://www.nwrfc.noaa.gov/stp/station/stpplot/stpplot.cgi?TDAO3>

Updated STP normals (climatologies) were published to the NWRFC web page on Oct 21, 2021.

Snow Water Equivalent

As an aid to better understanding conditions that impact hydrologic forecasts, the NWRFC webpage displays snow data and normals gathered from other agencies. In the United States, data is provided by the USDA Natural Resource Conservation Service. Canadian data comes from agencies affiliated with the governments of British Columbia and Alberta. The most widely used snow parameter for NWRFC forecasts is the snow water equivalent (SWE). SWE is the depth of liquid water held in the snowpack. SWE normals of mean (average) and median are displayed on the NWRFC web site and are based on 30 years of record, where available. Minimum and maximums are based on the full period record for a given gage.



Source: <https://www.nwrfc.noaa.gov/snow/snowplot.cgi?MLK11>

Updated SWE normals will be posted to the NWRFC website once all data becomes available. Posting is expected in the fall of 2021.